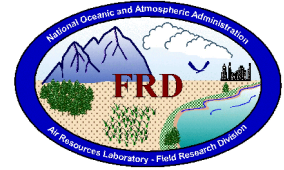


FRD Activities Report September 2002



Research Programs

CLAST-High

In early September, the BAT probe mounted on N43RF (one of two NOAA P3s) made several penetrations through Tropical Storm Eduoard. While the probe and associated instrument package appeared to operate as expected, the front portion of the hemisphere suffered damage due to pitting caused by the impaction of rain drops (Figure 1). It was decided that the probe should be repaired prior to another flight. The probe was returned to FRD and re-surfaced with a gel-coat over the original carbon-fiber hemisphere. Further testing revealed that while the gel-coat reduced the amount of pitting, it did not completely eliminate it. Within one week, a new solution was in hand, a hemisphere precision-milled out of 1024 aircraft aluminum (Figure 1). This new hemisphere was fitted with signal conditioning and sensor boards and plumbed as the original carbon-fiber models. Unfortunately, testing was not completed in time for mounting the new 'aluminum BAT' on N43RF for flights through Hurricane Lily. The probe is currently at AOC, awaiting completion of static load and vibrational tests before a functional flight will be made, likely in early October. There is still some hope that a flight through a tropical system will be possible before the end of October.

(Jeff.French@noaa.gov, Randy Johnson, Shane Beard)



Figure 1. The original carbon-fiber hemisphere from a BAT Probe (left) showing damage from pitting due to rain, and the new aluminum hemisphere (right) that will replace it on the NOAA P3 for future hurricane flights.

CBLAST-Low

Efforts are now underway to find a replacement aircraft to make turbulent flux measurements next August during the CBLAST-Low 2003 field study. Meanwhile, data analysis continues of data acquired during the CBLAST-Low 2001 pilot field study. (Jerry.Crescenti@noaa.gov, Tami Grimmett)

Refractive Turbulence Study

Nearly 40 hours were flown during the 3 ½ week field campaign from late August through mid-September based in Adelaide, Australia. A total of 10 flights were flown in the Egrett. Typical flights lasted 4 to 5 hours, but several were cut short due to weather or lack of turbulence.

The Egrett aircraft, owned and operated by Airborne Research Australia (ARA), was outfitted five years ago with two BATs (one under the left wing and a second on the tail) as well as a DLR-modified Rosemount 858 gust-probe. In support of this year's campaign (the fifth in as many years) the BATs were upgraded to use the FRD-designed FUST probe. The original micro-beads used to measure precision temperature suffered from noise contamination due to stress induced by vibration. This was more noticeable at higher altitudes where temperature structures are typically less pronounced. The FUST uses a fine thermocouple and a vented reference-junction in which the temperature is monitored using a slow-response, accurate thermistor bead. The thermocouple does not suffer any adverse effects due to vibration and hence has a considerably lower noise floor. (Jeff French@NOAA.gov)



Figure 2. The ARA Egrett aircraft showing the BAT mounted under the left wing. The FUST probe can be seen at the top of the BAT, protruding forward roughly 10 cm.

ET Probe

By early September, ARL had three ET probes ready for deployment in a landfalling tropical cyclone. As shown in Figure 3, the ET probe deployment kits have two main components: a 3 m tripod tower for the sphere, and an igloo enclosure for the notebook computer and batteries. These kits are lightweight but strong, and can be set up by one person in under half an hour. The first target of opportunity that came up in September was Hurricane Isidore, which made landfall in Louisiana on 26 September. A team from ATDD in Oak Ridge attempted to deploy the ET probes in Isidore, but developed vehicle problems en route to the Louisiana Coast and was forced to turn back. Although this first attempt to deploy ground-based instrumentation into a tropical cyclone was not a complete success, valuable information was still obtained regarding the ET probe's behavior and the procedures required for tropical cyclone deployment. (Richard.Eckman@noaa.gov, Ron Dobosy and Dave Auble [ATDD])



Figure 3. Photograph of ET sphere on 3 m tripod tower and igloo enclosure for computer and batteries.

IMS Development Project

The prototype Ion Mobility Spectrometer (IMS) being developed to measure atmospheric tracers was improved in three areas: an new ion gate, an improved aperture, and the addition of a data acquisition system. The new ion gate is made of ceramic to eliminate contamination sources. The circuit boards used to support the gate were first made incorrectly and had to be re-done. We then had great difficulty soldering the gate wires on to the gold traces without removing the traces from the board. Finally, a working gate was assembled on the last day of September. The combination of the new gate and the improved aperture increased the signal by about a factor of five. Since the noise in the system did not increase, the signal to noise ratio improved by a similar factor. The new gate also significantly reduced the contamination peaks present in the signal. The addition of a single board computer has allowed us to collect digitized signals and start testing signal processing algorithms.

Progress on this project was presented September 24, 2002 at the Joint URBAN-2003 Planning Meeting in Salt Lake City. At that time, the decision was made to not use the IMS as a tracer measurement instrument for that study. We will continue development at a much lower priority, as other funded programs must be completed first. We hope to take a few prototypes for deployment to Oklahoma City in 2003 to gain field experience with them.
(Roger.Carter@noaa.gov, Debbie Lacroix, Shane Beard)

Joint URBAN 2003

The major tracer experiment planned for Oklahoma City in July of 2003 has yet another name. It has been changed from URBAN 2003 to FOCUS and now to Joint URBAN 2003. The experimental plan is still in the preparation phase. However it is clear that FRD will be fully involved in the study by using all of its stationary and mobile real-time SF₆ detection equipment, and its SF₆ release equipment. The science team might also decide to use FRD's sodar. Kirk Clawson has been pegged by the science team to coordinate the tracer measurements conducted by the various participants. (Kirk.Clawson@noaa.gov)

Cooperative Research with INEEL

INEEL Support

The video card in one of the server computers for the INEEL Mesoscale Meteorological Network had to be replaced this month. These computers are about six years old. They have been very reliable, but may start experiencing more failures because of their age. (Roger.Carter@noaa.gov)

As reported last month, FRD is looking into possible options for upgrading the dispersion modeling it provides to INEEL operations. Another model candidate being considered for use is the HYSPLIT model developed at ARL headquarters, which is used in the READY system (<http://www.arl.noaa.gov/readyinfo.html>). HYSPLIT can be run either as a puff model or a Lagrangian particle model, and it has algorithms for deposition and radiological decay. Its main

drawback for INEEL applications is that the horizontal and vertical diffusion algorithms are geared towards long-range dispersion. This is particularly true of the horizontal diffusion, which is based solely on deformation of the flow field (*i.e.*, Smagorinsky diffusivity). The diffusion algorithms would have to be modified to adapt the model for INEEL use. However, any of the other models under consideration (*e.g.*, CALPUFF) would also require modifications, so HYSPLIT is still a viable candidate. (Richard.Eckman@noaa.gov)

INEEL Mesoscale Modeling

After encountering some problems in getting the standard MM5 graphics packages running on the new Dell workstation, investigations were made into using some alternate graphics packages. One possibility is the GEMPAK package from UCAR. It has a lot of capabilities for displaying model output, but the MM5 output must first be converted into the GEMPAK format. A MM5-to-GEMPAK converter was found on the Internet, but it appears to only work with MM5 version 2 output. FRD is using MM5 version 3 for its forecasts, and the format of version 3 output differs from version 2. (Richard.Eckman@noaa.gov)

Other Activities

OAR Outreach Committee

Jerry Crescenti has been asked to serve on the newly formed Exhibits Committee for OAR. It has been recognized that previous OAR exhibits have “lagged” behind those of the other NOAA line offices. Crescenti will bring his perspective of scientific field research towards developing a highly visible OAR exhibit that will be showcased at various professional meetings. (Jerry.Crescenti@noaa.gov)

Papers

Crescenti, G. H., 2003: In memory of Dr. Timothy L. Crawford, NOAA Air Resources Laboratory Field Research Division, Idaho Falls, Idaho. Preprint, *Twelfth Symposium on Meteorological Observations and Instrumentation*, Long Beach, CA, Feb. 9-13, Amer. Meteor. Soc., paper KS1.1.

Crescenti, G. H., and E. J. Dumas, 2002: Obituary: Timothy L. Crawford. *Bulletin of the American Meteorological Society*, **83**, in press.

Grimmett, T. K., G. H. Crescenti, T. L. Crawford, and D. C. Vandemark, 2003: Study of drag coefficient as a function of atmospheric turbulence and ocean wave state. Preprint, *12th Conference on Interactions of the Sea and Atmosphere*, Long Beach, CA, Feb. 9-13, Amer. Meteor. Soc., paper 4.3.

Proposals

Jeff French is a Co-PI on an internal NASA proposal submitted by Ed Teets of NASA/Dryden entitled, "Improving aerodynamic measurements using a Best Aircraft Turbulence (BAT) probe."

Travel

Jeff French returned on September 18 from a three week trip to Australia. The trip was to support the operation of instruments and to provide in-field processing of aircraft data collected during the Refractive Turbulence Study: OC5, in Adelaide, Australia.

Kirk Clawson and Roger Carter traveled to Salt Lake City, Utah on September 23-25 to participate in the Urban Dispersion Modeling Work Group Meetings. Planning for the Joint URBAN 2003 project was addressed during these meetings.

Training

Jerry Crescenti attended *Fundamentals of Effective Project Management*, 12 hours, Rockhurst University Continuing Education Center, September 16-17, 2002, Idaho Falls, Idaho.

Jerry Crescenti attended *Highly Effective Criticism and Discipline Skills for Managers and Supervisors*, 6 hours, Rockhurst University Continuing Education Center, September 23, 2002, Pocatello, Idaho.